CLAIMS

WE CLAIM:

1. A battery configured to be installed in a battery compartment of an electrical device, wherein the battery includes at least one air-depolarized cell to supply power to the device, the battery comprising:

a housing that defines a cell cavity containing the cell, the housing including:

i. a bypass airflow conduit extending through the housing and isolated from the cell;

ii. a second conduit defined by a gap between the cell and the cell cavity; and

iii. a housing inlet in fluid communication with the bypass airflow conduit and the second conduit; and

an air manager having an air mover configured to supply air to the inlet, wherein a first portion of the air travels along the bypass airflow conduit to stimulate air flow within the battery compartment, and wherein a second portion of the air travels along the second conduit to deliver oxygen to the cell.

2. The battery as recited in claim 1, wherein the air mover receives air from the battery compartment, and outputs the received air into the housing inlet.

3. The battery as recited in claim 1, wherein the first and second portions of air are exhausted from the housing and flow into the battery compartment via a housing outlet.

4. The battery as recited in claim 3, wherein a first portion of the exhaust air exits the battery compartment, and wherein a second part of the exhaust air is re-circulated to the air mover.

5. The battery as recited in claim 1, wherein the air mover operates at variable speeds.

6. The battery as recited in claim 1, wherein the housing further comprises a pair of adjacent cylindrical cell cavities having a "figure-8" cross sectional configuration, and wherein the bypass airflow conduit is centrally disposed between the cavities.

7. The battery as recited in claim 1, wherein the cell cavity is sized to receive at least one of a AA, AAA, AAAA, C, and D sized cell.

8. The battery as recited in claim 1, wherein the cell is a zinc-air cell.

9. The battery as recited in claim 1, wherein the first portion of air and the second portion of air exit the cell cavity via an outlet diffusion tube that extends between the bypass airflow conduit and the battery compartment.

10. The battery as recited in claim 1, wherein the first portion of air exits the bypass airflow conduit into the battery compartment, and wherein the second portion of air exits the second conduit into the battery compartment via an outlet diffusion tube that extends between the second conduit and the battery compartment.

11. The battery as recited in claim 1, wherein an inlet into the bypass airflow conduit is displaced axially downstream from the housing inlet.

12. The battery as recited in claim 1, further comprising an inlet diffusion tube extending between the air mover and the second conduit, wherein the second portion of air travels from the air mover to the second conduit via the inlet diffusion tube.

13. The battery as recited in claim 1, wherein the air mover is disposed in a chamber that is removably connected to the housing.

14. The battery as recited in claim 13, wherein the air mover comprises:

a flexible tubing extending between an inlet of the chamber and the housing inlet;

a rotatable pump head having protrusions extending therefrom configured to compress and subsequently depress the flexible tubing; and

a pump motor operable to rotate the pump head to drive air through the tubing and into the housing inlet.

15. The battery as recited in claim 1, wherein the air mover comprises a fan.

16. A battery configured to be installed in a battery compartment of an electrical device having at least one air-depolarized cell to supply power to the device, the battery comprising:

a battery housing that defines a cell cavity containing the cell;

a housing inlet;

a housing outlet in fluid communication with the housing inlet;

a conduit defined by a gap between the cell and the cell cavity and

an air manager having an air mover configured to supply air to the housing inlet, wherein a first portion of the air travels axially towards the housing outlet to stimulate air flow within the battery compartment, and wherein a second portion of the air travels along the conduit to deliver oxygen to the cell.

17. The battery as recited in claim 16, wherein the first and second portions of air are exhausted from the housing via a housing outlet into the battery compartment.

18. The battery as recited in claim 17, wherein a first portion of the exhaust air is re-circulated within the battery compartment to the pumping device, and wherein a second portion of the exhaust air exits the battery compartment.

19. The battery as recited in claim 16, wherein the conduit is radially offset from the housing inlet, and wherein the second portion of the air travels radially outwardly towards an inlet to the conduit.

20. The battery as recited in claim 16, wherein a third portion of air travels from the air mover into the battery compartment, without entering the housing inlet, to stimulate air flow within the battery compartment.

21. The battery as recited in claim 16, wherein the air manager is disposed within a chamber that is removably connected to the housing.

22. The battery as recited in claim 16, wherein the air mover is operable at variable speeds.

23. The battery as recited in claim 16, wherein the air mover comprises a fan.

24. The battery as recited in claim 16, wherein the air mover comprises:

a flexible tubing extending between an inlet of the chamber and the housing inlet;

a rotatable pump head having protrusions extending therefrom configured to compress and subsequently depress the flexible tubing; and

a pump motor operable to rotate the pump head to drive air through the tubing and into the housing inlet.

25. A battery configured to be installed in a battery compartment of an electrical device having at least one air-depolarized cell to supply power to the device, the battery comprising:

a battery housing that defines a cell cavity containing the cell;

a housing inlet; and

an air manager having an air mover configured to supply draw air from the battery compartment and supply a first portion of the drawn air to the cell via the housing inlet, and deliver a second portion of air to the battery compartment via an air manager outlet, wherein the second portion of air does not enter the housing inlet.

26. The battery as recited in claim 25, wherein the battery housing further includes a battery housing outlet to the battery compartment, and wherein some of the first portion of air travels directly from the inlet to the housing outlet, and wherein other of the first portion of air travels from the inlet to the cell.

27. The battery as recited in claim 25, wherein the second flow of air stimulates air flow within the battery compartment.

28. An air-depolarized cell battery comprising:

a battery housing defining a cell cavity containing an air depolarized cell, the housing having an inlet end;

a conduit in fluid communication with the inlet end for delivering air to the cell; and

an air manager operable to supply air to the housing inlet, the air manager including:

i. an air manager chamber connectable to the battery, the chamber defining an inlet end and an outlet end that is in fluid communication with the housing inlet; and

ii. a peristaltic air pump disposed within the housing, the air pump including:

(a) a flexible conduit extending between the housing inlet of the chamber and the housing inlet;

(b) a rotatable pump head having a plurality of protrusions extending therefrom sized to compress and subsequently depress the flexible tubing; and

(c) a pump motor operable to rotate the pump head to drive air from the chamber inlet, through the tubing, and into the housing inlet.

29. The battery as recited in claim 28, wherein the pump head further comprises three protrusions having tips that define an equilateral triangle.

30. The battery as recited in claim 28, wherein the protrusions comprise rollers that rotate along the tubing as the pump head is rotated.

31. The battery as recited in claim 28, wherein four protrusions extend from the pump head and engage the tubing.

32. The battery as recited in claim 28, wherein air pockets are formed between adjacent protrusions that engage the tubing, and wherein the air pockets are delivered to the housing inlet.

33. A method for operating an air-depolarized cell battery of the type having an air inlet, an air outlet, a cavity containing a metal air cell and defining a conduit around the cell, and an air mover operable to deliver air to the inlet, wherein the battery is disposed within a battery compartment, the steps comprising:

(A) delivering air from the battery compartment to the air inlet via the air mover;

(B) delivering a first portion of the air from the inlet to the outlet without engaging the cell to stimulate air flow through the battery compartment;

(C) delivering a second portion of the air from the inlet to the conduit to engage the cell; and

(D) directing the first and second portions of the air through the outlet as exhaust air;

34. The method as recited in claim 33, the steps further comprising:

(E) re-circulating a first portion of the exhaust air through the battery compartment to the pump; and

(F) directing a second portion of the exhaust air out the battery compartment.

35. The method as recited in claim 33, wherein the battery further comprises a bypass air conduit that extends from the inlet to the outlet, wherein step (B) further comprises directing the first portion of air through the bypass air conduit.

36. The method as recited in claim 33, wherein the battery responds to an electrical demand from an electrical device to supply current therefrom, and wherein step (A) further comprises:

sensing the electrical demand and operating the air mover at a speed suitable to deliver a requisite amount of oxygen to the cell to meet the electrical demand.

37. The method as recited in claim 36, wherein the requisite amount of oxygen is sufficient to meet an electrical demand of the air mover.

38. In an electrical device having (1) a load that draws current from a battery source, and (2) walls defining a battery compartment configured to accept a battery of a standard alkaline size and having terminals that are electrically connected to the load, the improvement comprising:

a battery cartridge adapted in shape to fit into the battery compartment while maintaining electrical communication with the load, the cartridge including:

(i) a battery housing encasing a pair of air-depolarized cells;

(ii) an air mover chamber operable to supply air to the cells when current is drawn by the load; and

(iii) positive and negative terminals operable to engage the terminals of the battery compartment.

39. The cartridge as recited in claim 38, wherein the cells are arranged in a side-by-side orientation

40. The cartridge as recited in claim 39, wherein the cells are disposed in cell compartments having a "Figure-8" cross sectional orientation.

41. The cartridge as recited in claim 38 having a size and shape of a pair of adjacent standard AA, AAA, AAAA, C, and D sized alkaline cell.

42. The cartridge as recited in claim 38, wherein the cartridge includes a first conduit configured to supply air to the cells, and a second conduit extending through the

chamber and isolated from the cells, and wherein the air mover chamber further comprises an air mover operable to supply air to the first and second conduits.

43. In combination,

an electrical device defining an openable battery compartment;

the battery compartment, when closed, being incapable, in the absence of an operating air moving device, of admitting sufficient air to support in excess of 0.045 watts per square centimeter of air electrode area from a metal-air battery;

an air depolarized power source including one or more air depolarized cells each including an air electrode in the battery compartment; and

an air mover in the battery compartment;

the air mover being positioned to direct air to the air electrode and to draw into the battery compartment, when closed, sufficient air to support output from the power source of at least 0.045 watts per square centimeter of air electrode area.